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A REPORT ON CONTINGENCY MANAGEMENT OF VERBAL BEHAVIOR.

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DESCRIPTORS- *EXCEPTIONAL CHILD RESEARCH, *MENTALLY HANDICAPPED, *LANGUAGE, *REINFORCEMENT, *BEHAVIOR, TRAINABLE MENTALLY HANDICAPPED, VERBAL OPERANT CONDITIONING, VERBAL STIMULI, LANGUAGE DEVELOPMENT, LANGUAGE FLUENCY, BEHAVIOR CHANGE, OPERANT CONDITIONING, POSITIVE REINFORCEMENT, PRESCHOOL CHILDREN,

THE STUDY INVESTIGATED SOME OF THE RELATIONSHIPS BETWEEN A CHILD'S VERBAL BEHAVIOR AND ENVIRONMENTAL EVENTS NECESSARY IN ACQUIRING LANGUAGE. TWO TRAINABLE RETARDATES (FROM A GROUP OF SIX, AGED 3-6 TO 5) WITH A FUNCTIONAL VOCABULARY OF NO MORE THAN TWO OR THREE WORDS WERE SEEN INDIVIDUALLY IN 20- TO 30-MINUTE SESSIONS TWICE A WEEK DURING A 4-MONTH PERIOD. DURING MOST SESSIONS THE SUBJECTS HAD ACCESS TO SIX WOODEN BLOCKS, A PAD OR PAPER, A CRAYON, AND A PACKET OF 4 X 6 CARDS. THE EXPERIMENTER WAS USUALLY SEATED AT A TABLE. PROCEDURES VARIED WITH EACH CHILD, BUT ALL WERE CRUDE CONTINGENCY-MANAGEMENT PROCEDURES. THE MAJOR DEPENDENT VARIABLE WAS THE FREQUENCY OF VOICED VOCALIZATIONS BY THE TWO SUBJECTS. ECHOING VOICED VOCABLIZATIONS RESULTED IN AN INCREASE IN THE FREQUENCY OF VOCALIZATIONS. EYE FIXATION BETWEEN THE SUBJECT AND THE EXPERIMENTER INCREASED WHEN POSITIVELY REINFORCED (CHANGING FACIAL EXPRESSION OR WAVING THE HAND). ONE SUBJECT LEARNED TO RESPOND TO THE COMMAND "T----COME." THE OTHER SUBJECT PERFORMED A COLOR DISCRIMINATION TASK. DATA INTERPRETATION WAS DIFFICULT DUE TO WEAKNESS IN PROCEDURES FOR MEASUREMENT OF THE DEPENDENT VARIABLES. SESSIONS ARE RELATED, AND THREE FIGURES PROVIDE DESCRIPTIVE GRAPHS. SEVEN REFERENCES ARE CITED. (AA/JD)

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A Report on Contingency Management of Verbal Behavior[1]

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2 trainable retardates, each with a functional vocabulary of no more than 2 or 3 words, were seen individually in 20-30 min. sessions twice a week during February through May. Procedures required no special equipment and could be used by classroom teachers. The major dependent variable was the frequency of voiced vocalizations by the 2 Ss. A variety of experimental procedures were used which influenced vocalization and other behaviors relevant to language acquisition.

The emission and maintenance of operant behavior is a function of the stimulus conditions preceding the behavior and the immediate consequences of the behavior. While it has not been proven that all or even most human verbal behavior follows the laws of operant behavior (cf. Skinner, 1957), it is clear that human verbal behavior interacts closely with the environmental conditions in which it occurs. One of the criteria we use in judging whether verbal behavior is "normal" or "psychotic" is whether or not it is appropriate to the environmental circumstances in which it occurs.

One can assume that in acquiring language a child learns some of the relationships between his own verbal behavior and (other) environmental events. It is well known that language acquisition is retarded partially or completely in an environment where there are few or no relationships between environmental events and behavior. It seems appropriate, therefore, to investigate some of these relationships.

Method

Ss were two trainable retardates taken from a class of six in the 3.5 to 5-year age group in the Regional Program for Trainable Retardates, located in the Pulaski School, Hamtramck, Michigan. T.M. interacted freely with his peers and with adults, whereas T.K. interacted with them only to a very limited extent and rarely initiated interactions. Neither had a functioning vocabulary of more than two or three words.

Each child was seen for approximately one-half hour on Tuesday and Thursday mornings in a bedroom complex where the children took their afternoon naps. The

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complex was comprised of a bathroom and four partitioned areas. Three of the areas contained two single beds each. The fourth and largest area contained eight single beds, three four-drawer chests, a record player, two mirrors, a chair, and a table with two chairs. The E was usually seated at the table.

The data were recorded by E during the sessions. Other observations were recorded afterwards in diary form. During most sessions Ss had access to six wooden blocks, a pad of paper, a crayon, and a packet of 4 x 6 cards. They could leave the table and E at any time. The first few sessions were primarily for general observation and habituation of E and Ss to the environment.

Procedures changed several times and will be described below in conjunction with presentation of results.

Results

The solid line in Figure 1 represents the number of voiced vocalizations emitted by T.K. during each session. The line of dashes represents the number of times T.K. looked at E. The frequency of both events increased.

Insert Figure 1 about here

The dotted line shows a decline in the frequency of visual self-stimulation, defined as the manipulation of T.K.'s fingers between an object and his eyes. The numbers across the top of the figure represent the times during each session S responded appropriately to the command "T----come!" and the number of times the command was issued.

Beginning with Session 8, E echoed each voiced vocalization emitted by T.K. The increase in frequency of vocalization suggests that this environmental consequence was effective in supporting the behavior.

The voiced vocalization reached a maximum of three to four per minute during Sessions 16, 17, and 18. Due to school vacations and illness of E, there were only two sessions during April, on the 19th and 21st. Voiced vocalizations were much lower on the 19th, higher on the 21st, and extremely low on the next session, May 10, As the regular sessions resumed, so did the vocalization.

An attempt was abandoned to record the total amount of time T.K. vocalized--both voiced and unvoiced. An increase from approximately 1 min. to 10 min. was recorded by means of a stop watch but measurement error seemed too high to place much credence in the record.

During Session 7 T.K. looked at E ten times. A "look" was defined as either a brief eye-fixation on E's eyes and/or face, or an eye-fixation on E's hand which persisted as E moved the hand to a new location from where it was when the fixation occurred. (No looks had been observed during the first six sessions.) E responded immediately to each look by saying "Hi!", changing facial expression, or waving his arm and hand. The general increase in frequency of looking suggests that these environmental consequences were effective in supporting the behavior.

The decreased frequency of looking from Sessions 18 to 21 is not as marked as the decreased frequency of voiced vocalizations during the same period. This result would be expected if (a) the increased vocalization occurred outside the experimental environment and was not supported, and (b) the looking did not generalize as much and was, therefore, not extinguished. The result would also be expected if both behaviors were generalized and only the looking was supported. While there is no information available to allow a decisions between these alternatives, it seems plausible that parents and teacher would be more likely to react to T.K.'s looking at them than to his "meaningless" voiced vocalizations.

T.K. left E's table frequently, particularly during the early sessions when he sometimes left (and returned) 15-25 times. (During later sessions he did so two to ten times per session.) E issued the command "T----come!" ten times during Session 7. T.K. returned seven times. Whenever he returned E handed him something he often handled, picked him up, or bounced him on E's knee. Commands were issued at first only when T.K. was inactive. Later the commands were issued whether or not he was actively engaged. Beginning with Session 8, E used the command to bring T.K. out of the classroom. He always responded to it, whether or not he could have seen E enter the classroom. During Sessions 9 and 10 E said several other words, e.g., "pumpkin," attempting to use a command intonation. T.K. never responded.

The dotted line shows a decline in frequency of visual self-stimulation. E recorded it but reacted in no other way. It usually occurred when T.K. encountered a new visual stimulus. During later sessions he would usually observe new stimuli without manipulating his fingers in front of them.

During Session 4 T.M. threw a colored block, laughed, and had the block retrieved by E a total of 75 times. During Session 5 E placed three wooden blocks (with holes drilled in them) on a stick, grasped the ends of the stick and held the blocks toward T.M. Two of the blocks would be red, yellow, or

blue, while the third would be one of the other two colors. If T.M. touched the odd-colored block E released it to him, allowed him to throw it, then retrieved it and presented another set of three blocks. If T.M. touched one of the same-colored pair, E held until T.M. released it and touched the odd-colored block.

T.M.'s first reaction when he touched a same-colored block was to attempt to pull E's hands away. E simply held on. T.M. then cried, peering through his fingers at E. E made no response. T.M. then hugged and kissed E who made no response. T.M. left the table, remaining away for the ten minutes which remained of the session.

During Session 6 the procedure was repeated. T.M. pulled, cried, or hugged for five minutes. Then he touched the odd-colored block which was released and thrown. During the test of the session, 15 of the sets of three blocks were presented. On five occasions T.M. touched the correct block first.

Figure 2 shows T.M.'s performance on the color discrimination task during Sessions 7-10. Total number of responses which were correct on the first attempt are plotted against the ordinal number of the trial. Thus, 100% correct performance would be represented by the line with the slope of 0.5 and 100% error would be a horizontal line along the x-axis. Chance performance would be represented by the line with the slope of 1/3.

Insert Figure 2 about here

The errors at the end of Session 7 seemed not to be due to any sort of forgetting but to failure of the task to support accuracy. An error delayed the opportunity to throw the block by much less than 1 sec. Therefore, a non-correction procedure was used during Sessions 8 and 10. When T.M. made an error the blocks were removed and another set of three presented.

The accuracy of the beginning of Session 8 supports the conclusion that errors at the end of Session 7 were due to failure of the task to support the behavior. A similar interpretation can be made of the errors at the end of Session 10. On the last four trials T.M. did not throw the blocks, and he did not respond to the task during later sessions.

No data are presented for Session 9 since T.M. did not come to E's table. He appeared unhappy in the classroom, protested leaving it, spent the session

at the bed where he took his afternoon nap, and protested returning to the classroom.

Figure 3 presents data from a series of sessions in which E echoed T.M.'s voiced vocalizations. During the first five minutes of the session on March 22, T.M. emitted seven voiced vocalizations. (Nearly all of his vocalizations were voiced.) During the five minutes which began with the first vocalization, one minute and five seconds after the five-minute baseline period, all voiced vocalizations were echoed. During the final ten minutes none were echoed. The abrupt cessation of vocalizing was due to a four-minute trip to the bathroom. Upon returning, vocalization resumed, although not at its former level. It then fell to zero.

Insert Figure 3 about here

The March 24 session began with a four-minute baseline period during which no vocalizations were echoed. During the fourth minute, T.M. went to the bathroom, returning during the eighth minute. During minutes 15-21 every second vocalization was echoed. A lower frequency resulted.

The March 29 session consisted of (a) a three-minute baseline period, (b) three minutes of echoing every vocalization, (c) one minute of echoing every second vocalization, and (d) 13 minutes of echoing only vocalizations which began with the voiced bilabial stop consonant /b/. During minutes 8-15 only such vocalizations were recorded. Beginning with minute 16 all vocalizations were recorded. Vocalizations beginning with /b/ are shown by the lower line of the two on that part of the graph.

A similar procedure was used during the April 19 session as shown on part of the graph in Figure 3. The procedure was still inadequate to sustain vocalization long enough to obtain a preponderance of vocalizations beginning with /b/.

Instead of echoing every second vocalization during the April 21 session, E echoed approximately 50% of the vocalizations during minutes 2-10. Sometimes as many as six consecutive vocalizations would not be echoed and sometimes as many as six consecutive ones would be echoed. The procedure seemed to produce a more stable rate of vocalizing but was not sufficient to sustain a high level of vocalizing for the final ten minutes during which only those beginning with /b/ were echoed.

A similar procedure was used again but was not sufficient to sustain vocalization during the May 10 session. However, vocalizing was sustained somewhat longer on May 12, when only one third of the vocalizations were echoed during the second minute. During the third minute, one fourth of the vocalizations were echoed because of a fortuitously high number beginning with /b/.

Another procedure was used which maintained vocalization during the short May 19 session. All vocalizations beginning with /b/ were echoed as were approximately 50% of all other vocalizations.

Discussion

A major problem in interpreting these data is a weakness in procedures for measurement of the dependent variables. It is well known that Es are not unbiased measuring instruments (cf. Azrin et al., 1961). Several steps were taken to counteract possible biases. The children's classroom teacher served as one check since she did not know the nature of the experiment. If changes seen by E were transferred to the classroom and were of sufficient magnitude to be noticed by the teacher it would indicate that they were real. There was one confirmation of this sort in that the teacher indicated surprise when T.K. responded to "T----come!" Other changes noted by the teacher were not significant enough, and/or sufficiently unrelated to things being worked on in class to be attributable to the experimental procedures.

As another attempt to counter bias, dependent variables were selected which could be easily discriminated by E and which could be counted and recorded using tally marks. A high rate of vocalization sometimes emitted by T.M. was the most difficult to record. In cases where it was doubtful that a sound could have had sufficient pause to be counted as two vocalizations, it was recorded as one. When it was difficult for E to discriminate an initial consonant, a vocalization was recorded. The sound was not recorded as /b/. Both of these biases were counter to the direction of the change E was attempting to produce.

By not graphing or reviewing the data after each session, E attempted to counter the tendency to change his criteria and thereby smooth or augment changes. Data were reviewed once in April and again prior to the May 31 session. Data collected during the May 31 session are not included in the results but will be discussed below.

It is impossible to know how successful these countermeasures were. However there are large enough fluctuations in the data to indicate that something other than the mother's eye bias was influencing what was recorded. The changes observed in the long experiment with T.K. and in the several short experiments with T.M. are large enough to lend plausibility to the contention that the "something other" was the behavior of T.K. and T.M. The data are similar in many respects to data collected under much better conditions (cf. Schulzbacher & Costello, 1967)

The changes in T.M.'s behavior were rapid enough so that we can be reasonably sure that they were the result of the specific procedures used. This is not the case with the changes in T.K.'s behavior.

While the responsiveness to "T----come!" can perhaps be attributed to the procedure used to acquire and maintain it, it would be more reasonable to leave open the possibility that the increase in frequency of vocalization and looks at E were not due solely to E's reaction to them. The increases in T.K.'s vocalizations may have been an example of the behavioral contrast phenomenon (cf. Reynolds, 1961) stemming from the absence of aversive control techniques during the experimental sessions. For example, most of the vocalization by T.K. and T.M. observed in the classroom and in the first few experimental sessions occurred when the teacher attempted to get them to do something they resisted doing, or when the teacher or E prevented them from doing something they had begun. In elementary school classrooms teachers spend a great deal of time attempting to get children to do things. The techniques frequently used are, in operant conditioning terms, mild forms of aversive control. When told by word and gesture to sit at a table and to work on a task, the child who does not comply is frequently led to the table. Resisting leads to a stronger pull, which can be a mild punishment. The stronger pull can be avoided or escaped (negative reinforcement) by complying. Attempts to leave are punished or extinguished--depending upon the persistence of the child and teacher--by physically preventing the child from leaving.

Potential positive reinforcement is available primarily from achievement at the task and from the teacher's praise. In the case of children like T.K., these sources of positive reinforcement are virtually unavailable since he tends not to react to people or to possible social reinforcers they might attempt to provide. Achievement at tasks selected by the teacher appeared to be minimally reinforcing or not reinforcing.

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All procedures used with T.M. and the procedures used with T.K. to reinforce responding to the command and looking at E were crude contingency-management procedures (cf. Homme, 1966; Homme & Tosti, 1966). While echoing vocalizations was an activity observed to be effective with T.M. during the early sessions it was used with T.K. for want of an alternative. No other environmental consequences were found which (a) did not disrupt ongoing behavior, (b) could be provided from E's table, and (c) which seemed to stand a better chance of being positively reinforcing.

Except occasionally, in returning T.K. or T.M. to the classroom, the mild aversive control inherent in forcing them to move from place to place (or not to move) was not used. Tasks were made available but not forced. Attempts at changing their behavior began by observing to find out what things were likely to be positively reinforcing when presented.

Since the procedures used were selected in part so that they would be used by a classroom teacher without special equipment, a comment is in order about the use of the non-correction procedure in the color discrimination task with T.M. In most tasks the child has only a small number of responses to make. For example, if a teacher holds up two objects and asks how many there are the child who would be doing such a task may only be able to say four numerals. Thus, if he says "three" and is told "no," he is then looked at, obviously, an unknown number of objects which can be described by "one," "two," or "four." Assuming that he knows "one," that leaves "two" and "four." If he says "two and gets a "yes" he might have learned that those objects are called "two." However, in this situation one very frequently observes that, after making the first error, the child attends to the teacher rather than the objects. The child may well have learned for example, that ΔΔ is not three. (That's what the teacher said, after all.) Since the child was looking at the teacher just prior to saying "two," the ΔΔ--"two" relationship is really not likely to have been learned. On a subsequent trial presenting ΔΔ, ΔΔΔ, or ΔΔΔΔ, the child is very likely to say "two." This woulc confirm either of two misconceptions on the teacher's part. If ΔΔ were presented it would confirm erroneously that the child had learned ΔΔ--"two"; and if ΔΔΔ were presented it would confirm erroneously, that retarded children have short memory spans.

The same difficulty is present whether due to good communciation or "teacher reading" skills often found in children or whether due to sequential response effects often demonstrated with college sophomores and lower organisms.

Be that as it may, non-correction procedures go a long way toward eliminating the problem of reduction of alternatives through a guessing strategy. Presenting a new problem does not reduce the number of alternatives unless the Ss learn that the teacher never presents a second problem that has the same answer as the first one, which they can readily do if she consistently does not present a second with the same answer as the first. People do exhibit non-random biases of this sort (cf. Skinner, 1942) which can be learned, but the problem is much less severe with a non-correction procedure.

Data from the final session on May 31 were not presented above but deserve comment. They were not presented since the session occurred after those data had been graphed by E and since the bedroom complex was being prepared for the end of the school term. Window shades had been removed making the rooms lighter and the beds were disarranged.

The procedures were the same as for the preceding session. T.K. vocalized 177 times, much more than ever before. This last session was the only one in which there was good evidence that echoing the vocalizations affected frequency of occurrence. In addition to the higher frequency there was some temporal patterning coordinated with looking at E. For example, on one occasion T.K. vocalized rapidly, looked at E, stopped for a few seconds, then vocalized once more. Still looking at E he vocalized slowly a few more times, then rapidly, then slowly.

The session with T.M. was the first since May 19 and the same procedure was used. All vocalizations beginning with /b/ were echoed as were approximately 50% of all others. The percentage of vocalizations beginning with /b/ was higher than for any other session, although the procedure did not maintain an exceptionally high rate of vocalization. The remarkable thing was that it did maintain vocalization during the last ten minutes, when a class of older children came to the complex to rearrange and make the beds in preparation for afternoon naps. T.M. also stayed at E's table throughout that time, although he usually interacted freely with other people.

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Footnote

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Figure Captions

Fig. 1. Child T.K.'s frequency of voiced vocalization, looks at E, visual self-stimulation, and responses to "T----come!"

Fig. 2. Child T.M.'s performance on a color discrimination task. Cumulative number of correct responses plotted against ordinal number of the trial.

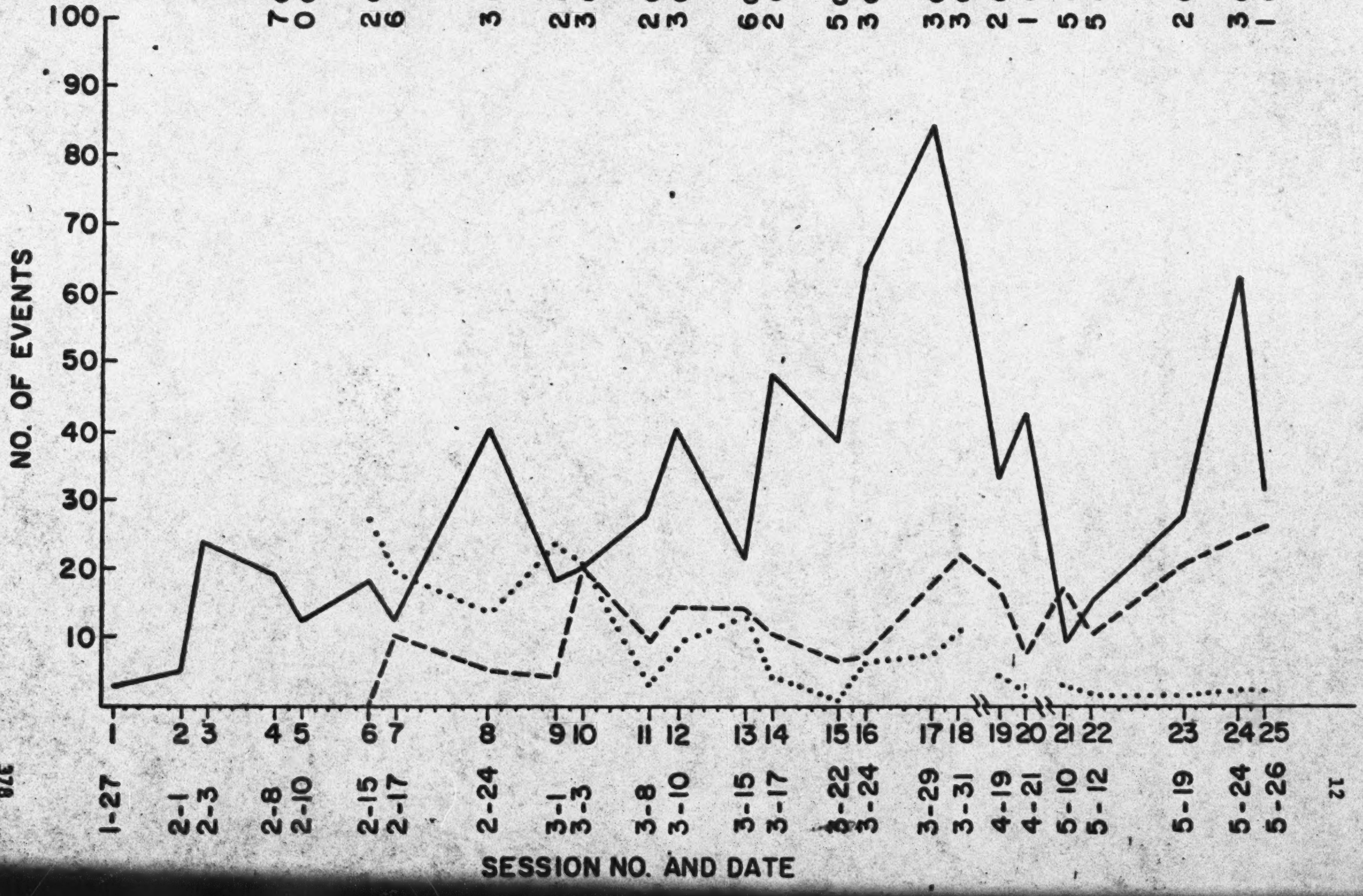
Fig. 3. Child T.M.'s frequency of voiced vocalization during each minute of eight sessions. The experimental condition is indicated on each graph. See text for more detailed explanation.

Child T.K. Frequency of

Voiced vocalization ——————
Looks at E. – – – –
Visual self-stimulation .....
Responses to "T.... come! x of y

7 of 10
0 of 0
2 of 2
6 of 6
3 of 3
2 of 4
3 of 4
2 of 3
3 of 4
6 of 6
2 of 4
5 of 5
3 of 4
3 of 4
4 of 4
2 of 3
– of –
5 of 7
5 of 5
2 of 2
3 of 4
– of –

Brethower



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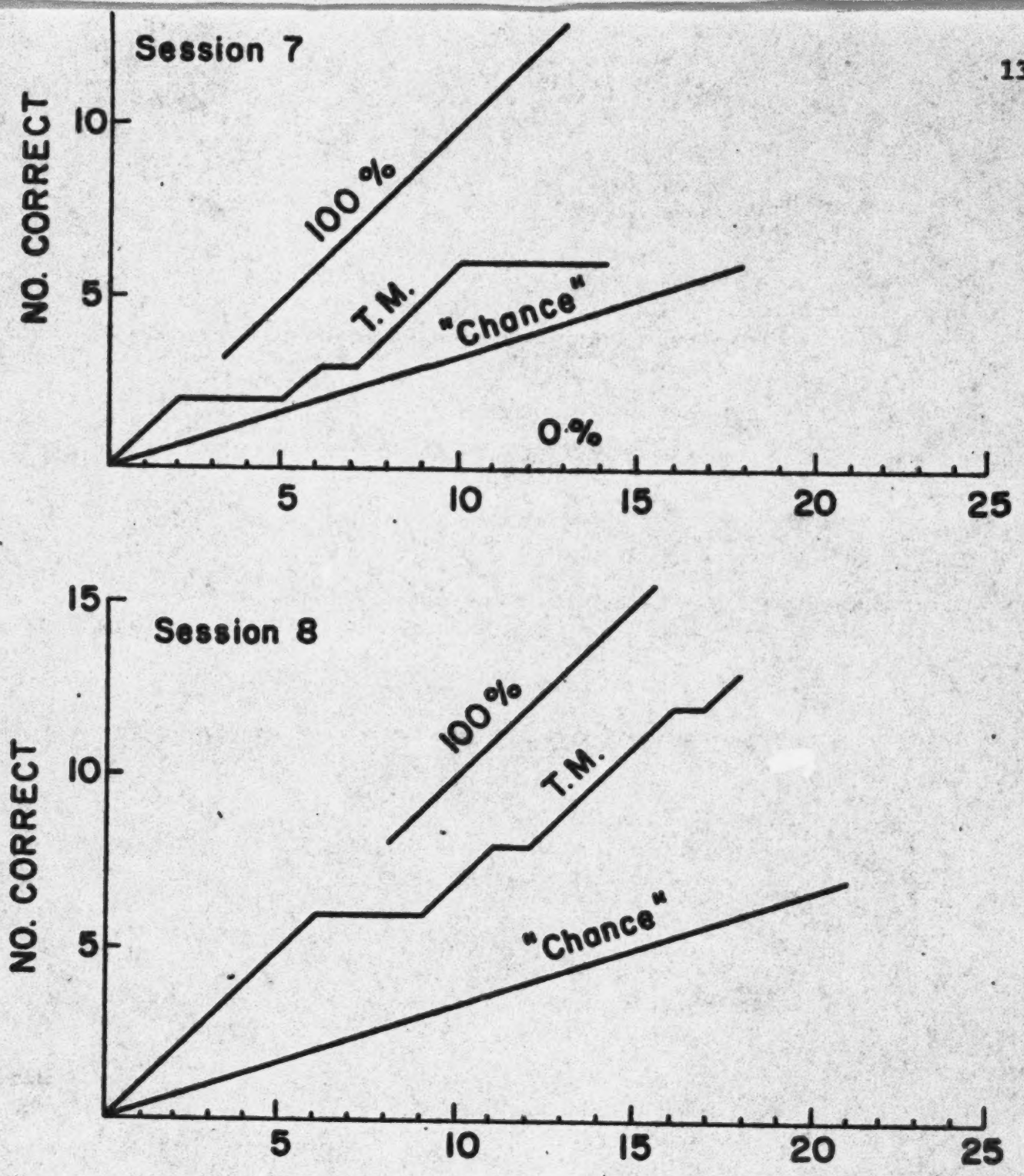
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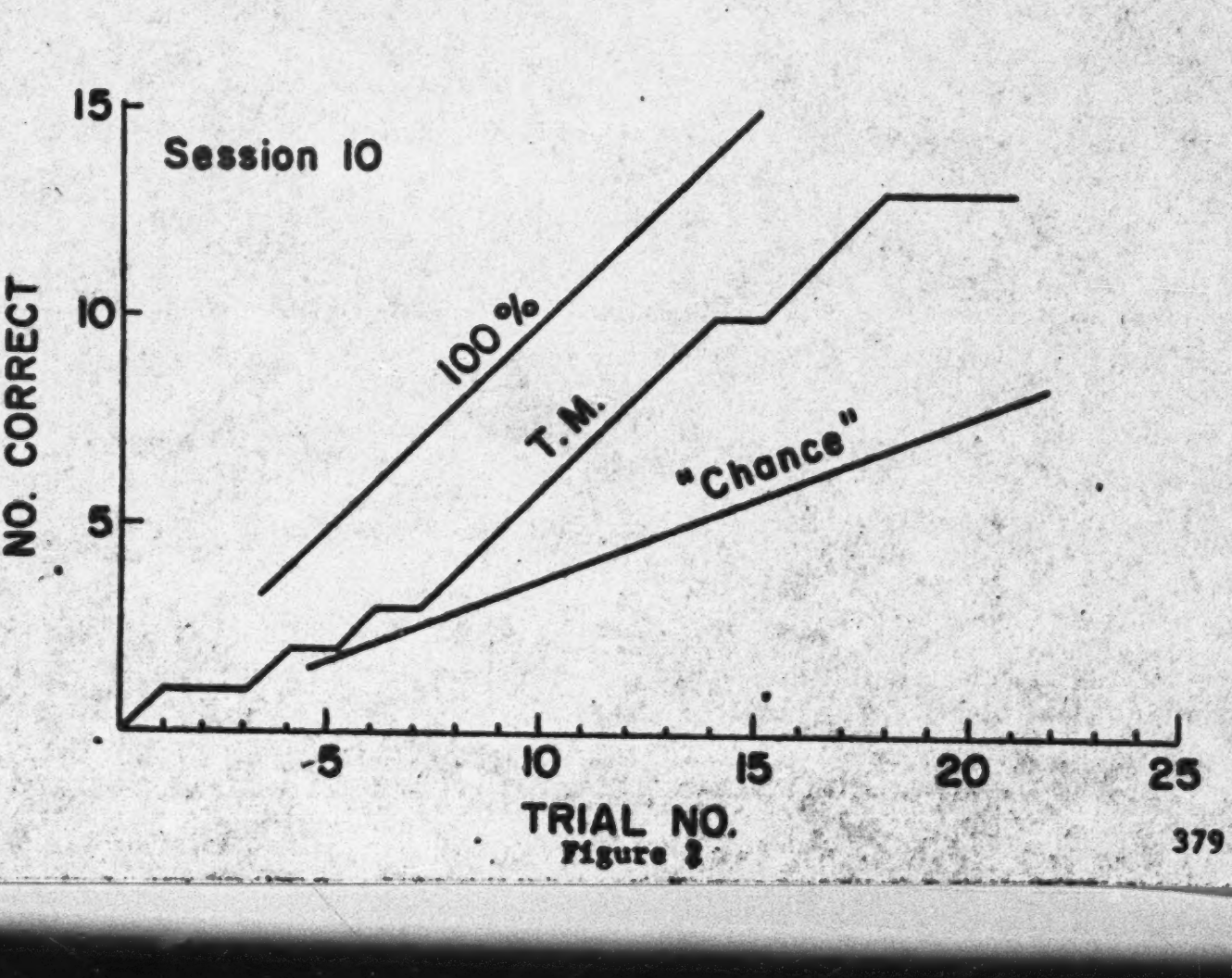
5
100 %
T.M.
"Chance"
0%
5
10
15
20
25


Session 8
NO. CORRECT
15
10
5
100%
T.M.
"Chance"
5
10
15
20
25

Session 10
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10
5
100%
T.M.
"Chance"
-5
10
15
20
25
TRIAL NO.

Figure 2

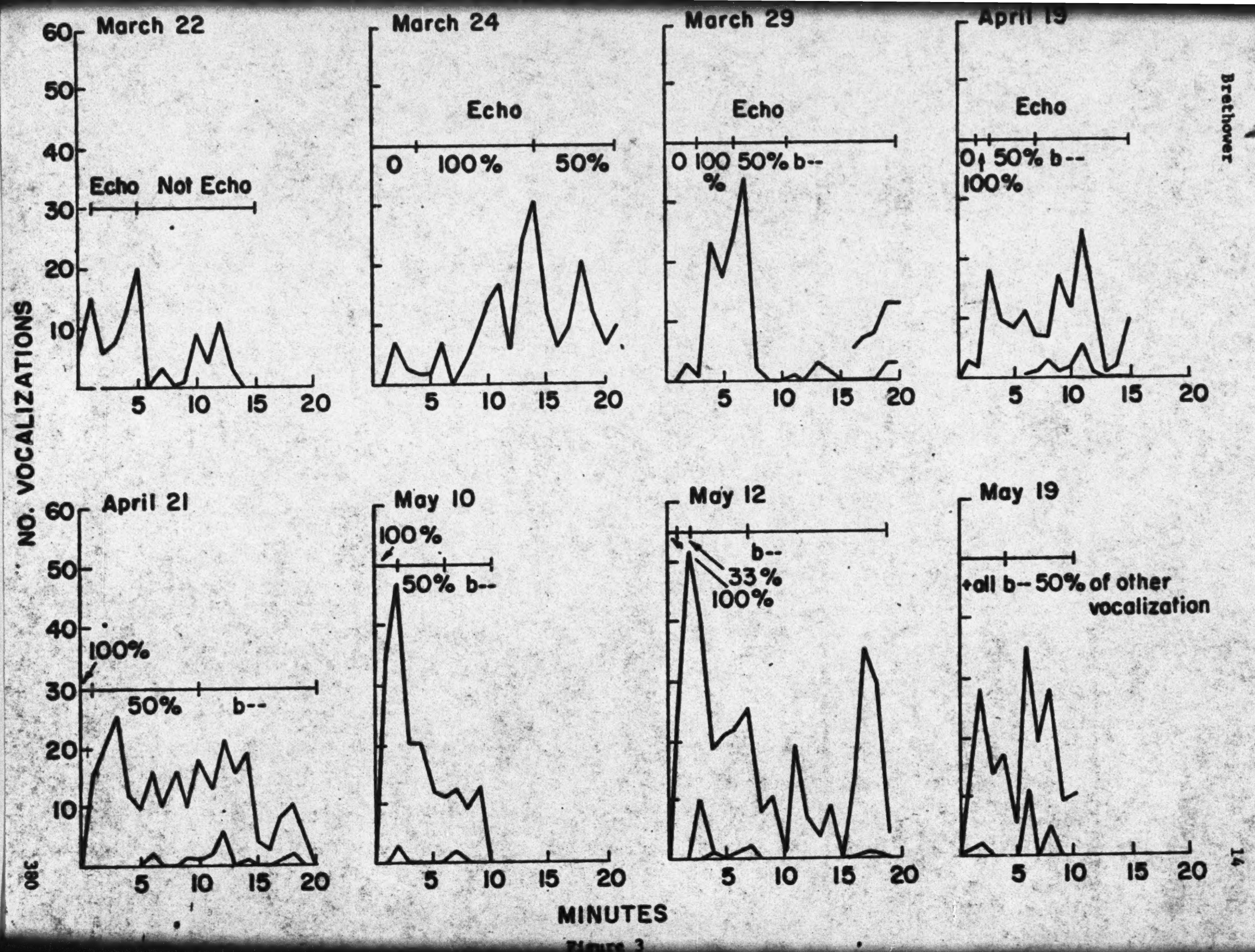
March 22
Echo Not Echo
March 24
Echo
0 100% 50%
March 29
Echo
0 100% 50% b--
%
April 19
Echo
0 50% b--
100%
April 21
100%
50% b--
May 10
100%
50% b--
May 12
b--
33%
100%
May 19
+all b-- 50% of other vocalization
NO. VOCALIZATIONS
MINUTES
60
50
40
30
20
10
5
10
15
20

Figure 3